The Use of Digital Visualization and Production Planning: Robust Stamping

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The engineering of stamping processes has already undergone a monumental transformation—traditional methods of physical tooling development and die tryout have been augmented in large part by Computer Aided Engineering (CAE) and stamping Finite Element Analysis (FEA). Many say that the trade of developing dies has completed a transition from "art" to science. However, if one were to look very closely at the application of these tools in the typical tool and die shop that assertion does not hold up to scrutiny.

Surely, very few tool shops are cutting and building proof tools to validate their process concepts; hard tools are cut from math data directly leading to shortened and highly successful tryout. The missing detail lies in the fact that most of these stamping practitioners have merely traded the use of their presses for the virtual presses of the CAE and FEA, without really diminishing their use of trial and error. In the typical application of computer FEA methods a virtual die is built and tried out using, to the best knowledge of the operator, data representing a potential reality. After simulating this potential reality and gathering the results a judgment in made as to the "quality" of the results and then perhaps a process change or tooling change is made, then re-simulated. Once a "passing" result is obtained the die is then built to match the math-data as simulated.

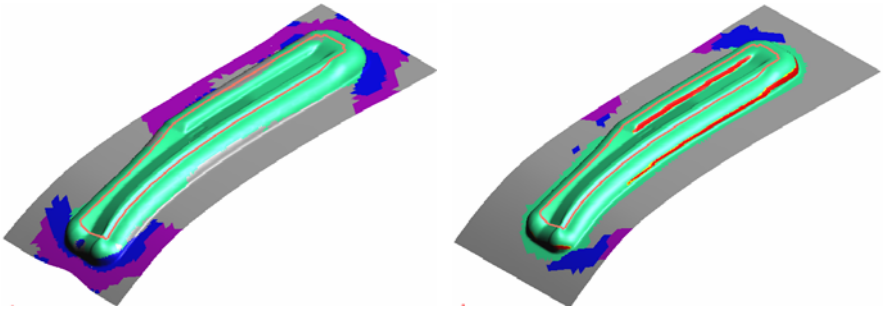

Figure 1. A passing simulation is not always enough. What separates these two results?

Passing the computer simulation still is not a guarantee of success in the ensuing weeks, as the conditions present during die tryout may not in fact be representative of the conditions used to simulate the tooling process. The computer aided engineering model is only one potential reality—a snapshot of what *could* happen if all the process input conditions are met. The simulation must assume a single set of process conditions—material properties, blank condition, tool settings, press settings, lubrication and so on. On passing simulation many are quick to point to the passing result as a direct indication that the process is good, failing to recognize the singularity of that success; only one good passing trial, only one set of process conditions that have been "proven" to produce acceptable results.

If after completing die tryout we only showed our customer a single clean panel, would that be enough to make them buy the die? No, our customer insists on doing Statistical Process Control (SPC) measurements on a larger lot of panels produced off